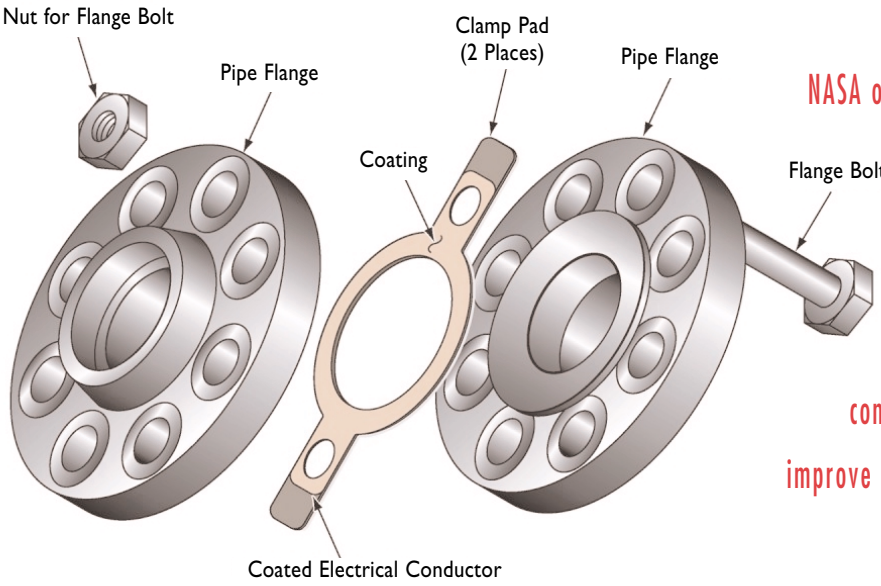
Revolutionary Low-Cost Joints



NASA offers companies the opportunity to license or jointly develop innovative thermal joint technologies that combine the benefits of, and improve upon, bolted and welded joints.

Developed at NASA Marshall Space Flight Center (MSFC), these low-cost technologies use a thermal element to seal, bond, braze, and/or weld static joints. Joints fabricated with these technologies can be permanently assembled with minimal process variability, may optionally be disassembled for service, and do not degrade over time.

Benefits

- Low cost
- Welding or brazing control problems eliminated
- Easy disassembly possible
- No volatile organic compounds produced
- Machining eliminated
- Compatible with existing gasket-cutting systems
- Thinner joints for reduced relaxation problems
- Easy to use
- Fast melting and curing process
- Low ignition risk

Commercial Applications

These technologies could be used in a wide variety of static sealing applications for bolted, bonded, brazed, and welded joints:

- Chemical/industrial piping joints
- Marine engine and transmission housing joints
- Piping joints for heating, ventilation, and air conditioning (HVAC) steam, chilled water, and refrigerant
- Automotive engine cooling system housing joints
- Sealed electrical housings and cabinet joints

National Aeronautics and Space Administration

The Technology

Surface irregularities, joint pressure extrusion, and stress relaxation can cause leaks in conventionally bolted and gasketed joints. Although liquid sealants can reduce leaks by filling surface imperfections, adhering to joint surfaces, and minimizing gasket thickness, process control is difficult, curing is time consuming, fumes introduce an environmental concern, and servicing can be difficult. Liquid sealants used in a highly finished joint can fail, resulting from sealant breakdown or extrusion. Brazed and welded joints eliminate some limitations and costs of bolted joints, but they increase undesirable process variability and hinder future disassembly.

To address the limitations of these conventional joining and sealing technologies, NASA Marshall Space Flight Center developed new thermal joint techniques. For a typical installation, an electrically or thermally conductive substrate assembly is positioned in the joint under a preload and uniformly heated. An electrically conductive substrate is heated by passing an electrical current—either continuous or impulse—through it. A thermally conductive substrate is heated by connecting the substrate to an external heat source. Once the substrate is heated, some preload is released into the interface to complete the connection. The joint is fully cured within a few minutes after the heat source is disconnected from the substrate.

Substrates are generally coated with adhesives, thermoplastics, or braze alloys that melt when heated. For flanged and bolted joints, a flat substrate is coated on both sides with an adhesive, a thermoplastic, or a braze alloy. For sleeve joints, the conductive substrate is in the form of a hollow cylinder coated on the inside. For welded joints, an uncoated conductive element might be fabricated from a perforated or mesh material to enhance joining.

Partnering Opportunities

This technology is part of NASA's technology transfer program. The program seeks to stimulate development of commercial uses of NASA-developed technologies. Several patents are pending on this technology, and development and testing are continuing. NASA invites commercial companies to consider licensing or jointly developing this technology. NASA is flexible in its agreements, and opportunities exist for exclusive, nonexclusive, and exclusive field-of-use licensing.

For More Information

If you would like more information about this technology or about NASA's technology transfer program, please contact:

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More information about working with MSFC's Technology Transfer Department is available online.

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